SITE: Carborundum Co.
BREAK: 1.7
OTHER: V1

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Remediation
4th Floor, L &C Annex
401 Church Street
Nashville, Tennessee 37243-1538

December 5, 2006

John Nolen
Site Assessment Project Officer
U.S. Environmental Protection Agency
Region 4
61 Forsyth Street S.W.
Atlanta, GA 30303-8909

Dear John:

Enclosed is the PrS for the Carborundum site in Campbell County, TN. Staff is recommending further investigation at this site in the form of a PA/SI combo.

If you need additional information or have any questions, please contact me at (615) 532-0925.

Sincerely,

Suzanne Wilkes

Suzanne Wilkes
Division of Remediation

10692268

EPA Superfund
Pre-CERCLIS Screening Assessment:

THE CARBORUNDUM COMPANY
ELECTRO-MINERALS DIVISION
EPA ID: TND057049322
09/15/06
CAMPBELL COUNTY, TN

Pre-CERCLIS Screening Assessment

The Carborundum Company
ElectroMinerals Division
TND057049322
Campbell County, Tennessee

September 2006

Authored by:	
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Environmental Protection Specialist	
Division of Remediation	
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TN Department of Environment and Conservation	Date: 12/04/06
Reviewed by:	
Donna Webster, RPM	
EPA R4	Date: 1/22/07

(Prescreen Checklist in Appendix 3)

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Pre-CERCLIS Screening Assessment

SITE NAME: The Carborundum Company, Electro Minerals Division
TDEC Division of Remediation Site # 07-506
U.S. EPA ID # TND057049322

LOCATION: Stone Mill Road, Campbell County, Tennessee
36° 18′ 32.9″ North Latitude
84° 11′ 01.1″ West Longitude

1.0 INTRODUCTION

The Tennessee Division of Remediation has been tasked by the U.S. Environmental Protection Agency (U.S. EPA) Waste Management Division to prepare a Pre-CERCLIS Screening Assessment for the above referenced site. This Report will be prepared pursuant to the authority and requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), Public Law 195-510, Section 104, the Superfund Amendments and Reauthorization Act (SARA) of 1986, Public Law 99-499, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300).

1.1 Objectives

The objectives of this Report are to determine what steps, if any, need to occur next at the site. Federal, State, and local government files, geological and hydrological data, and data concerning site practices were reviewed to complete the PSA report. On- and off-site reconnaissance also was conducted. Available information may allow EPA to make an early decision to undertake a combined PA/SI, an SI, or another Superfund investigation.

Specific elements of the objectives include the following:

- Characterize the history, location, and nature of past hazardous materials management and disposal activities at the site
- Collect data on the levels and extent of the contaminants present at and near the site, and describe any release and the probable nature of the release
- Obtain information to prepare a preliminary HRS score, including potential receptors impacted by any contamination migrating from the site
- Provide EPA the necessary information to make decisions on any other action warranted at the site
- Provide a recommendation on whether further action is warranted, which lead agency should conduct this, and whether an SI or removal or both should be undertaken

1.2 Scope of Work

The scope of this report includes, but is not necessarily limited to, the following activities:

- Obtain and review background materials relevant to HRS scoring of site
- Obtain available maps of the site
- Obtain information on local water systems
- Evaluate the target population along the 15-mile surface water pathway and within a 4-mile radius of the site with regard to surface water use, the possibility of direct contact, ground water use, fire and explosion hazard, and airborne exposure
- Develop a detailed site sketch
- Evaluate environmental samples previously collected to detect the presence of any hazardous substances at the site, to identify source area(s) for contaminants, to identify chemicals of concern, and to estimate the extent of the contamination.

1.3 Schedule

Sample and Analysis Plan preparation will be scheduled after this Report has been submitted to the U.S. EPA, and approval is issued.

1.4 Site Location and Climatology

Location

The Carborundum Company, Electro Minerals Division Site (the Site) is located on Stone Mill Road in Caryville, Campbell County, Tennessee (Vicinity Map, Figure 1). The geographic coordinates of this facility are 36° 18′ 32.9″ North Latitude and 84° 11′ 01.1″ West Longitude.

Climatology

East Tennessee does not lie directly within any of the principle storm tracks that cross the country. The area is influenced primarily by storms that pass along the Gulf Coast and thence up the Atlantic Coast, and to a lesser extent by those that pass northeastward from Oklahoma to Maine.

Temperature

The difference in elevation between mountain top and valley in East Tennessee causes a considerable variation in temperature. The mean annual temperature of East Tennessee, based upon records from Chattanooga, Knoxville, and Bristol is between 57 and 58 F. Temperature extremes of -32 F in Johnson City and 111 F in Campbell County have been recorded. July is the hottest month and January is the coldest. The usual date of the last killing frost ranges from March 30 in Hamilton County to May 10 in Johnson and Carter Counties. The usual date of the first killing frost ranges from October 5 in Johnson and Carter Counties to October 30 in Hamilton County. The growing season varies from 150 to 210 days, depending upon latitude and elevation.

Precipitation

Precipitation in East Tennessee is controlled in part by topography. It is heavier on the Cumberland Plateau and in the Unaka Mountains than in the Valley and Ridge province. Moist air masses reach the Valley and Ridge province comparatively dry because, in passing over the mountain on either side, their moisture is condensed and precipitated.

Rainfall is well distributed in the study area throughout the year. The area's wettest months are January, February, and March (averaging 4.66, 4.51, and 5.05 inches, respectively) and the driest are September, October, and November (averaging 2.68, 2.62, and 3.07 inches, respectively). Snow occurs only occasionally and lightly in the lowland or valley land, and usually melts within a few hours or days except in shaded areas or near the tops of some of the highest ridges.

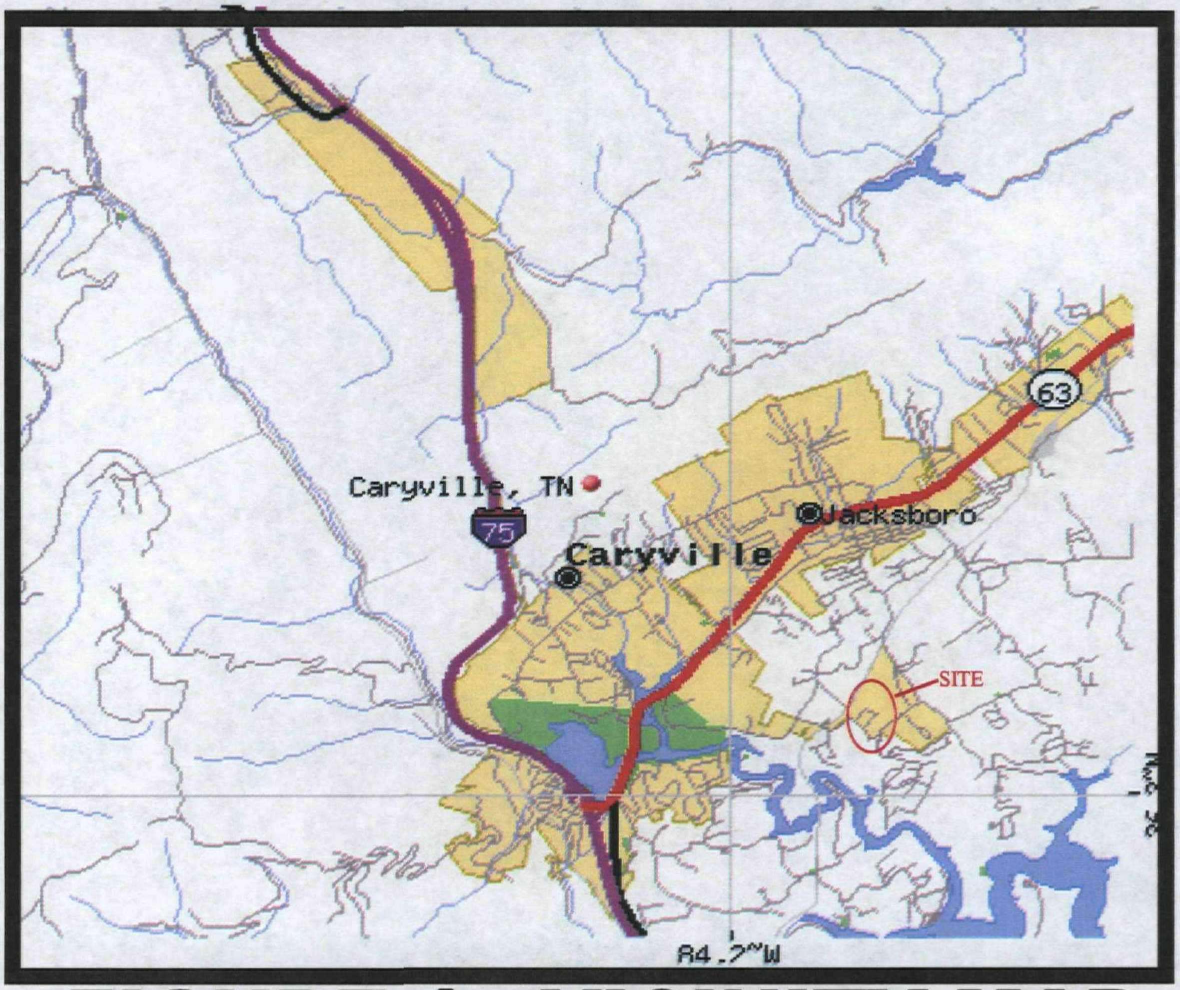

FIGURE 1 - VICINITY MAP

The topography largely controls the prevailing wind direction. The prevailing winds are from the northeast (15% of the time) and the southwest (12% of the time), but they are relatively light (mean speed is approximately 7.5 mph). Calm conditions exist 11% of the time (USDC/NOAA 1968).

1.5 Site Description, Operational History, and Waste Characteristics

Site Description

The Carborundum Electro Minerals Site includes 105 acres. There are now several active industrial/commercial facilities located on contiguous properties that are presently under separate ownership, and the Site contains a public road. There is residential, commercial, and industrial development near the Site. Groundwater from a nearby spring is used as the primary source for a municipal water system that is also supplied with surface water from an intake in the surface water pathway from the Site. Groundwater may be used for private drinking water supplies at some nearby residences. The nearest school, Jacksboro Elementary School, is approximately 0.9 mile from the Site. A church, formerly a school/daycare, is located on-site. Much of the surface water drainage from the Site flows to an on-site sinkhole or an on-site pond that rarely discharges, according to the property owner. A surface discharge from the pond can flow to an underground culvert. The destination of flow from the underground culvert is presently unknown.

The Site contains a landfill, a backfilled settling pond, process material storage areas, a sinkhole, a transformer area, and numerous process building sites where releases of hazardous substances may have occurred.

Operational History

The manufacturing facility which is the subject of this report is an electric furnace facility of The Carborundum Company. The plant was constructed by The Carborundum Company and began operation in 1971. It produced about 25,000 tons per year of "Ferro-Carbo", a granular material high in silicon carbide content, which is ultimately used as a metallurgical additive in the cast iron and steel industries. (Noll 1981. Letter from J. McDowell, Noll Associates to J. Leonard, DSWM. June 10.)

Raw materials used in the manufacture of Ferro-Carbo included petroleum coke and sand. These materials were batched in proper proportions and heated to reaction temperature in an open railroad car furnace. Upon completion of the reaction, the batch was cooled with water and unloaded, with the reacted product then being separated from unreacted raw material ("old mix"). The reacted material was then crushed and blended to form the final end product.

Raw materials generally arrived by rail and were normally bottom dumped into a track hopper in building 22 (see Figure 2, Structure Identification (Noll 1981. Letter from J. McDowell, Noll Associates to J. Leonard, DSWM. June 10.)) and conveyed directly to storage silos in building 21. Raw materials were also stockpiled in the open, principally in the north and northeast portions of Figure 2. Stockpiles of old mix and wet sawdust were also stockpiled in this general area. The sawdust was blended with the raw materials to help maintain porosity during subsequent processing.

Raw material proportioning and loading into the car furnaces occurred in buildings 21 and 30. During the loading process, a core of graphite was placed lengthwise within the charge to provide electrical conductivity and to establish a suitable resistance between terminals situated at either end of the furnace. The loaded car furnace was then transferred through a railway turntable to one of six firing stations, where the electrical hookup was accomplished. A suitable reaction temperature was then established and maintained until the reaction was complete.

After a suitable cooling period, the car furnace was moved to building 40 where the unreacted material was removed. During the reaction process, this material served to insulate sides of the car furnace from intense heat developed at the core. This unreacted material, now known as "old mix", was transferred to the old mix storage pile.

The car furnace with the reacted material was then allowed to cool further. At this point, the reacted material was in the form of a large hollow cylinder. This material was subsequently fed to a crusher and transferred by conveyor for final processing.

Waste Characteristics

The Division of Solid Waste Management received analyses of baghouse dust and pond sediment (both buried on-site) from Carborundum in 1981. The main chemicals of concern were found to be polycyclic aromatic hydrocarbons (PAHs). No analyses were performed for asbestos or TCDD (dioxin), because neither was considered to be "pertinent to wastes disposed at the site and both require[d] very special analysis" (Carborundum. 1981, "Summary of Environmental Testing Program at Jacksboro, Tennessee Electro Minerals Plant Site", March 13). Some of these analytical results are summarized and compared to criteria of concern in the table below.

Analytical Data

The Carborundum Company, Electro Minerals Division Wastes

hazardous substance / sample date, description, and *criteria of concern*	Benzo(a)-anthracene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(a)-pyrene
1981 Baghouse Dust	32,917	31,176	U	119,710
1981 Pond Sediment	13,317	10,159	U	45,059
PRG - residential soil	***620***	***620***	***6200***	***62***
PRG - industrial soil	***2100***	***2100***	***21,000***	***210***
Soil Screening Levels for Migration to Groundwater	***80-2000***	***200-5000***	***200-49,000***	***400-8000***

units: ug/l

The sources at the Carborundum Electro Minerals Site include any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that may have become contaminated from hazardous substance migration. In general, however, the volumes of air, ground water, surface water, and surface water sediments that may have become contaminated through migration are not considered sources.

In addition to potential off-site sources where atmospheric deposition of air emissions occurred, the following specific, potential source types were present at the Site:

1) Wastes, contaminated soils, and leachate associated with a burial ground
2) Waste piles, contaminated soils, and leachate associated with a backfilled sediment pond
3) Water, sediment, leachate, and berm construction materials associated with an existing surface impoundment
4) Waste piles, contaminated soil, and leachate at an "old mix" storage area for unreacted and partially reacted materials that were removed from furnaces
5) Waste piles, contaminated soil, and leachate at process areas where potential releases occurred, including areas associated with the following structures:
   a) firing stations
   b) old mix dumping
   c) cylinder cooling
   d) crushing
   e) product screening
   f) product storage
   g) maintenance shop
   h) raw material storage
   i) thawing shed
   j) furnace charging
6) Contaminated soil and leachate associated with an electrical transformer area
7) Waste piles, contaminated soil, and leachate associated with the "boneyard" (scrap pile) area

Site Investigation Activities

The Division of Air Pollution Control no longer maintains files on this facility; however, the Rules of the Division of Air Pollution Control, Chapter 1200-3-19, "Emission Standards and Monitoring Requirements for Additional Control Areas" lists the area bounded by the fence along the property line of the Carborundum Company as a Particulate Additional Control Area. Division personnel who observed operations at the Site have stated that there were significant air quality concerns. Many complaints about emissions from the facility were received from nearby residents. Additional air pollution control equipment and a larger settling pond were installed shortly before operations ceased.

The Division of Solid Waste Management/KFO files contain information that indicates that Carborundum's emissions were collected by air pollution control devices, then disposed of, along with other wastes, in a landfill on Carborundum's property. Carborundum requested permission to dispose of 5000 tons of silicon carbide material in 1981, when the Division of Solid Waste Management approved a closure plan relative to the solid wastes remaining on the Site.

The Division of Remediation collected five on-site waste samples in 2006. Some of these analytical results are summarized and compared to criteria of concern in the table below.

Analytical Data

The Carborundum Company, Electro Minerals Division Wastes

hazardous substance / sample date, description, and *criteria of concern*	Benzo(a)-anthracene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(a)-pyrene
2006 waste pile at settling pond	2914	5330	U	4050
2006 waste pile at storage area	717	1032	U	903
2006 subsurface waste at storage area	717	1030	U	903
2006 waste pile at firing station	6850	14,700	4660	9830
2006 waste pile at baghouse/cylinder cooling/product screening area	U	490	U	384
PRG - residential soil	***620***	***620***	***6200***	***62***
PRG - industrial soil	***2100***	***2100***	***21,000***	***210***
Soil Screening Levels for Migration to Groundwater	***80-2000***	***200-5000***	***200-49,000***	***400-8000***

units: ug/l

2.0 PATHWAYS

2.1 Groundwater Pathway

2.11 Hydrogeology

The Carborundum Electro Minerals Site is located in the Southeastern Valley and Ridge physiographic province and the nonglaciated central region hydrogeologic setting. Numerous ridges and intervening valleys characterize the land surface in the Valley and Ridge physiographic region, all trending in the northeast-southwest direction. This orientation is the result of folding and fracturing.

The Cambrian-Ordovician Carbonate aquifer of eastern Tennessee (recently renamed the Valley and Ridge aquifer) consists of extensively folded and faulted carbonate, sandstone, and shale of Cambrian and Ordovician age underlying the Valley and Ridge physiographic province. The rock formations crop out alternately in long, narrow belts, so that aquifer characteristics show marked areal variability. The ridges range in altitude from about 1,500 to over 7,000 feet above sea level;

valleys generally range between 750 and 1,000 feet above sea level. Generally regolith is thin over the shales and sandstones and thick over the limestone. The sandstone and shale units are poor aquifers; nearly all the high producing wells and springs are in the dolomitic limestone formations, particularly the upper formations of the Knox Group (Mascot and Kingsport). The Knox aquifer is frequently singled out as a separate aquifer. Water moves through solution-enlarged fractures, which in areas may form extensive networks. The folding and faulting has produced regional anisotropy in aquifer hydraulic properties, and ground water may move preferentially in strike-parallel or strike-normal directions. Well yields commonly range from 5 to 200 gal/min.

The Mascot Formation of the Knox Group underlies the Site. The bedrock consists of essentially flat-lying siliceous (cherty) dolomites and limestones. Weathering of the rock occurs along nearly horizontal bedding planes and enlarged vertical fractures (joints), producing moderately to highly plastic clays containing varying amounts of chert. Soil depths in this area are generally less than twenty feet, although greater depths may be encountered. (MCI 1981. "Close-out Procedures, The Carborundum Company". August 24.)

2.12 Groundwater Targets

Cave Spring is approximately 0.2 mile distant from the Site. The Cave Spring Well Head Protection Area surrounds the Site. The Caryville-Jacksboro Utility District's Cave Spring intake supplied 0.653 million gallons average daily pumpage in 2005. The Norris Lake intake provided 0.378. The population served was 9252. The Cave Spring intake served approximately 9252x0.653/(0.653+0.378)=5860 population.

Several private wells may be in use at nearby residences. The 1995 U. S. Geological Survey National Water-Use Data Files lists 17,150 self-supplied population by ground-water withdrawals for domestic water use (USGS. 1995. U.S. Geolgical Survey, National Water-Use data files. http://water.usgs.gov/watuse/spread95/tnh895.txt) in the 1970 square mile Upper Clinch hydrologic unit, HUC8Code 06010205 (USGS. 2005. U.S. Geolgical Survey, Water Resources of the United States. http://water.usgs.gov/GIS/huc_ name.txt Last updated June 16.).

Proportioned by area, by distance category, the following target self-supplied populations by ground-water withdrawals for domestic water use have been estimated:

distance category (radius, in miles)	area (square miles)	target population
0 to ¼	0.196	2
¼ to ½	0.589	5
½ to 1	2.36	21
1 to 2	9.42	82
2 to 3	15.7	137
3 to 4	22.0	192
0 to 4	50.3	439

The total groundwater pathway target population is 439 + 5860 = 6299.

2.13 Groundwater Samples

The Division of Remediation collected water samples from Cave Spring in 2006. Some of these analytical results are summarized and compared to criteria of concern in the table below.

Analytical Data

Cave Spring, a tributary of Norris Reservoir

sample date, description, and *criteria of concern* \ hazardous substance	Benzo(a)-anthracene	Benzo(b)-fluoranthene	Benzo(k)-fluoranthene	Benzo(a)-pyrene
May 2006 Cave Spring	U*	0.210	0.080	U*
June 2006 Cave Spring	U*	U*	U*	U*
June 2006 Cave Spring (treated municipal water)	U*	U*	U*	U*
Preliminary Remediation Goal (PRG) - tap water	***0.092***	***0.092***	***0.92***	***0.0092****
Consumption Of Water and Organism	***0.0038****	***0.0038****	***0.0038****	***0.0038****
Consumption Of Organism Only	***0.018***	***0.018***	***0.018***	***0.018***
Primary Drinking Water Maximum Contaminant Level (MCL)	***5***	***-***	***-***	***0.2***

units: ug/l *detection level = 0.01

2.14 Groundwater Pathway Conclusions

On one occasion, a groundwater sample collected from Cave Spring, at a distance of 0.2 mile from the Carborundum Electro Minerals Site, exceeded the following criteria of concern for benzo(b)fluoranthene and benzo(k)fluoranthene:

PRG - tap water
Consumption Of Water and Organism
Consumption Of Organism Only

A subsequent sample did not detect these compounds, however, some criteria of concern were below the detection level.

A release to groundwater may be indicated. Concentrations of contaminants are present in wastes at the Site at levels that may indicate that migration to groundwater could occur. The on-site release of unknown quantities of wastes in an uncontained manner on permeable soil in a Karst region of shallow ground water has occurred. Heavy precipitation occurs in the area. There is usage of groundwater resources in the area of the Site, but all specific locations are unknown and their locations will require further investigation.

2. 2 Surface Water Pathway

2.21 Site Conditions

The Site is located near the Cove Creek and the Cave Spring embayments of Norris Reservoir. The only surface water flows presently on the Site are due to stormwater runoff. A small portion of the surface water flow from the Site appears to flow to the Cave Spring embayment, which then flows to the Cove Creek embayment. The remaining surface water flow from the Site appears to flow to a sinkhole on the Site, thence to Cave Spring.

The Site does not appear to be in the 100-year floodplain, although heavy rainfall may flood the sinkhole and cause an overflow to adjacent property to the northeast.

The surface water pathway is classified for Industrial Water Supply, Fish and Aquatic Life, Recreation, Livestock Watering and Wildlife, and Irrigation by the State of Tennessee along the entire surface water pathway within the 15-mile target distance limit. Portions of this reach are classified for Domestic Water Supply.

2.22 Surface Water Targets

The targets along the 15-mile surface water pathway include users of that portion of the Norris Reservoir fishery and recreation areas, some users of the Caryville-Jacksboro Utility District's water supply system, fish and aquatic life, livestock, wildlife, and potential wetland areas.

2.221 Fisheries

The 15.0-mile surface water pathway associated with the Site is classified for Fish and Aquatic Life and is used for fishing. The production of fish species may be up to 1000 pounds per year, or more.

2.22~~3~~2 Public Drinking Water Intakes

The Caryville-Jacksboro Utility District maintains a domestic water supply intake in the Cove Creek embayment of Norris Reservoir at approximately 4.3 miles along the surface water pathway.

2.23 Surface Water Samples

Cave Spring is approximately 0.2 mile distant from the Site. This spring may be potentiometrically downgradient of the groundwater surface expected to be at the Carborundum Electro Minerals Site. One aqueous sample collected from this spring was found to contain benzo(b)fluoranthene and benzo(k)fluoranthene, which are also documented to be found, by chemical analysis, to be in sources at the Carborundum Electro Minerals Site. A subsequent aqueous sample found no detectable levels of these hazardous substances, at a detection level greater than some levels of criteria of concern.

2.24 Surface Water Pathway Conclusions

Unknown quantities of hazardous substances are contained in sources at the Site, where releases to surface water may have occurred. There are potential off-site sources and releases to surface waters. The direct observation of releases to groundwater indicates a potential for groundwater to surface water migration. The potential exists for impacts to public drinking water intakes, fisheries and recreation areas, public areas, residences, aquatic life, wetlands, livestock, wildlife, private drinking water intakes, and receptors of irrigated food crops. Hazardous substances were located in an area where precipitation is sometimes heavy and releases have occurred. Some of the detected hazardous substances in sources at the Site are bioaccumulative, toxic, and persistent in the environment.

2.3 Soil Exposure Pathway

2.31 Site Soil Conditions

The Carborundum Electro Minerals Site lies in a commercial, industrial, and residential area along Stone Mill Road in Caryville. The Site is minimally restricted so that the Site is moderately accessible.

Large quantities of hazardous substances were managed at the Site. The potential for spills onto the ground and for contaminated groundwater to migrate to the surface could cause soils to become contaminated. Particulate emissions to the ground occurred during the facilities' active periods.

2.32 Soil Exposure Targets

An estimated 12,900 people live within four miles of the Site, and 1310 within one mile, based on the 2000 census data. There is no resident population, but approximately 30 people work on the Site. Access to the site is not restricted, thus, soil exposure could occur. Potential targets along the on-site soil exposure pathway appear to be workers, adults, and children from area neighborhoods. The nearest presently operating daycare facility and school are over 200 feet away from suspected areas of contamination at the Site. A church, formerly a school/daycare, is located on-site. There may be residences within 200 feet of the facility. The off-site soil exposure pathway is relatively uninvestigated, but complaints, from residents, of particulate and gaseous emissions to off-site properties have occurred.

2.33 Soil Exposure Pathway Conclusions

There is no known resident population. Several workers are present on the Site. The nearest residences may be within 200 feet of the Site. Heavy particulate migration via the air pathway occurred from the active facility, which increases the possibility of exposure via the soil pathway.

There is unrestricted access to portions of the Site. Hazardous substances exist and cause exposure when entry to the Site occurs. The presence of hazardous substances contaminating the soil at this site is certain, but definition of the threats posed by the soil exposure pathway is not complete.

2.4 Air Pathway

2.41 Site Conditions

The Carborundum Electro Minerals Site lies in a commercial, industrial, and residential area on Stone Mill Road within the Caryville city limits. Entry onto the Site occurs daily. Particulate and gaseous migration occurred while the facility was active, and could still occur due to uncontained wastes and contaminated soil.

2.42 Air Pathway Targets

An estimated 12,900 people live within four miles of the Site, based on the 2000 census data. An estimated three persons (primary targets) reside within ¼ mile, and 30 persons work on the Site. There is no resident population. Access to the site is not fully restricted. Potential targets along the on-site air pathway appear to be workers at the Site or adults and children from area neighborhoods. The nearest presently operating daycare facility and school are over 200 feet away from suspected areas of contamination at the Site.

2.43 Air Monitoring

No known air monitoring has been conducted at the inactive facility.

2.44 Air Pathway Conclusions

The Carborundum Electro Minerals Site could pose a threat to human health and/or the environment via the air pathway. The potential for particulate migration makes further investigation of exposure via the air pathway of importance.

CONCLUSION

A State-lead or EPA-lead Combined PA/SI Assessment meeting the separate preliminary assessment and site inspection requirements set forth in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300) is recommended. A removal assessment of waste and contaminated soils should be given consideration.

***

LIST OF REFERENCES
CARBORUNDUM ELECTRO MINERALS
CAMPBELL COUNTY, TENNESSEE 37714
U.S. EPA ID # TND057049322
TSDF #07-506

#	REFERENCE	PAGE
1	Noll. 1981. Letter from J. McDowell, Noll Associates to J. Leonard, DSWM. June 10.	4
2	Carborundum. 1981. "Summary of Environmental Testing Program at Jacksboro, Tennessee Electro Minerals Plant Site", March 13.	5
3	MCI. 1981. "Close-out Procedures, The Carborundum Company". August 24.	8
4	USGS. 1995. U.S. Geolgical Survey, National Water-Use data files. http://water.usgs.gov/watuse/spread95/tnh895.txt	8
5	USGS. 2005. U.S. Geolgical Survey, Water Resources of the United States. Last updated June 16. http://water.usgs.gov/GIS/huc_ name.txt	8

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JUN 12 1981

NOLL ASSOCIATES TENNESSEE INCORPORATED
ENVIRONMENTAL ENGINEERS

June 10, 1981

Mr. John Leonard
Tennessee Department of Public Health
Division of Solid Waste Management
1522 Cherokee Trail
Knoxville, Tennessee 37920

Dear Mr. Leonard:

Pursuant to agreements reached at the June 9, 1981 meeting at your office with Kennecott Company representatives, we are enclosing a four-page general description of the silicon carbide manufacturing process formerly used at the Carborundum Company plant near Jacksboro, Tennessee,

Also enclosed are three copies of a plant site plan which identifies the old mix stockpile location, the refuse pile location and the "natural pond" location.

If you need additional information, please contact me or Mr. Wilcox.

Sincerely yours,

NOLL ASSOCIATES TENNESSEE, INC.

John R. McDowell

John R. McDowell
Vice President

jj

cc: Mr. Bob Wilcox

Enclosures

INTRODUCTION

The manufacturing facility which is the subject of this report is an electric furnace facility of The Carborundum Company located at Jacksboro, Tennessee. The plant was constructed by The Carborundum Company and began operation in 1971. It currently produces about 25,000 tons per year of "Ferro-Carbo," a granular material high in silicon carbide content, which is ultimately used as a metallurgical additive in the cast iron and steel industries.

Raw materials produced in the manufacture of Ferro-Carbo include petroleum coke and sand. These materials are batched in proper proportions and heated to reaction temperature in an open car furnace. Upon completion of the reaction, the batch is cooled and unloaded, with the reacted product then being separated from unreacted raw material ("old mix"). The reacted material is then crushed and blended to form the final end product. A simplified schematic diagram of the process is shown in Figure 1.

Figure 2 is a schematic diagram identifying the main buildings at the plant site. Raw materials generally arrive by rail and are normally bottom dumped into a track hopper in building 22 and conveyed directly to storage silos in building 21. Rail shipment schedules cannot be expected to match production schedules; consequently raw materials are also stockpiled in the open, principally in the north and northeast portions of Figure 2. Stockpiles of old mix and wet sawdust are also stockpiled in this general area. The sawdust is blended with the raw materials to help maintain porosity during subsequent processing.

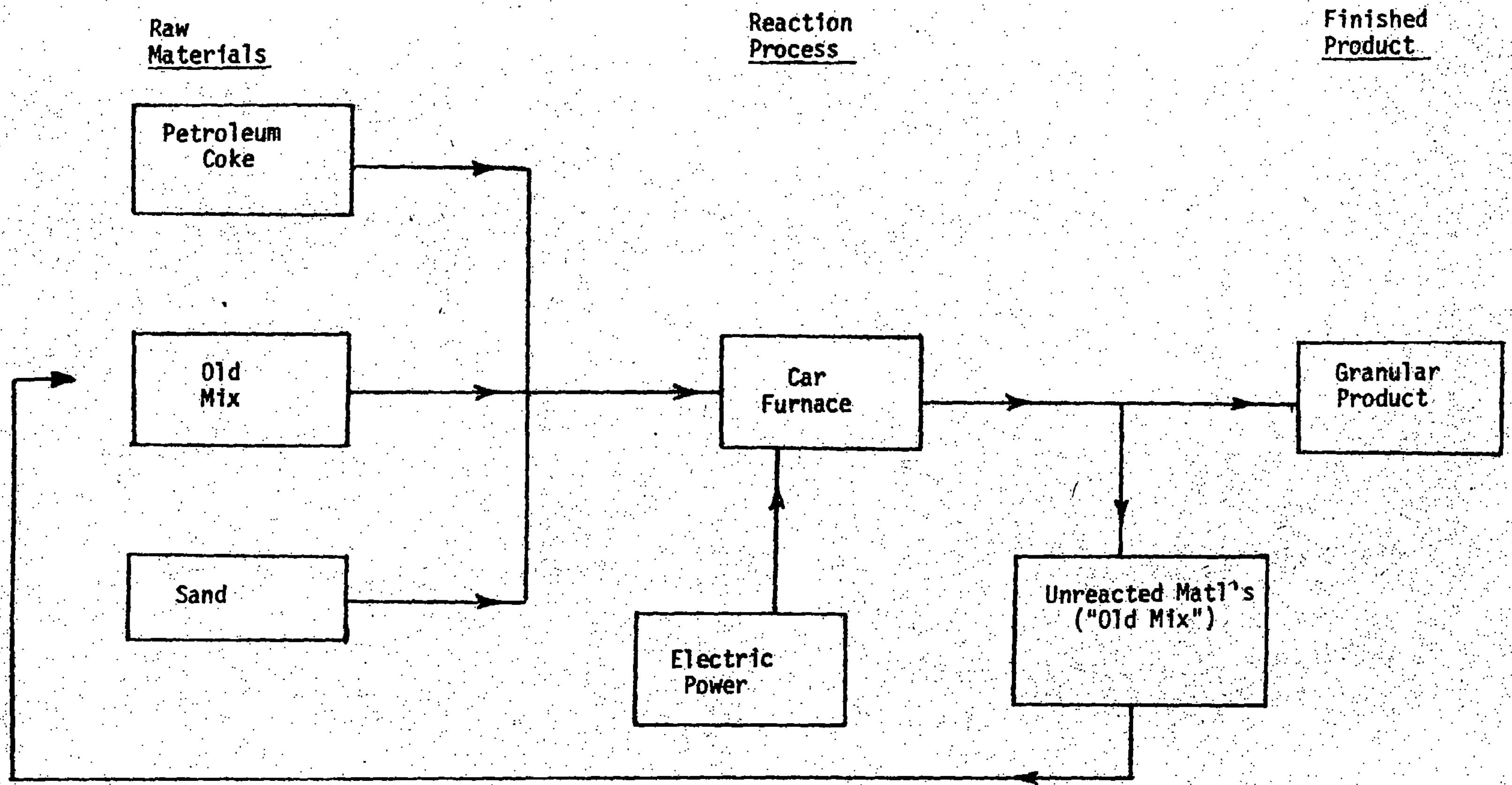


Figure 1

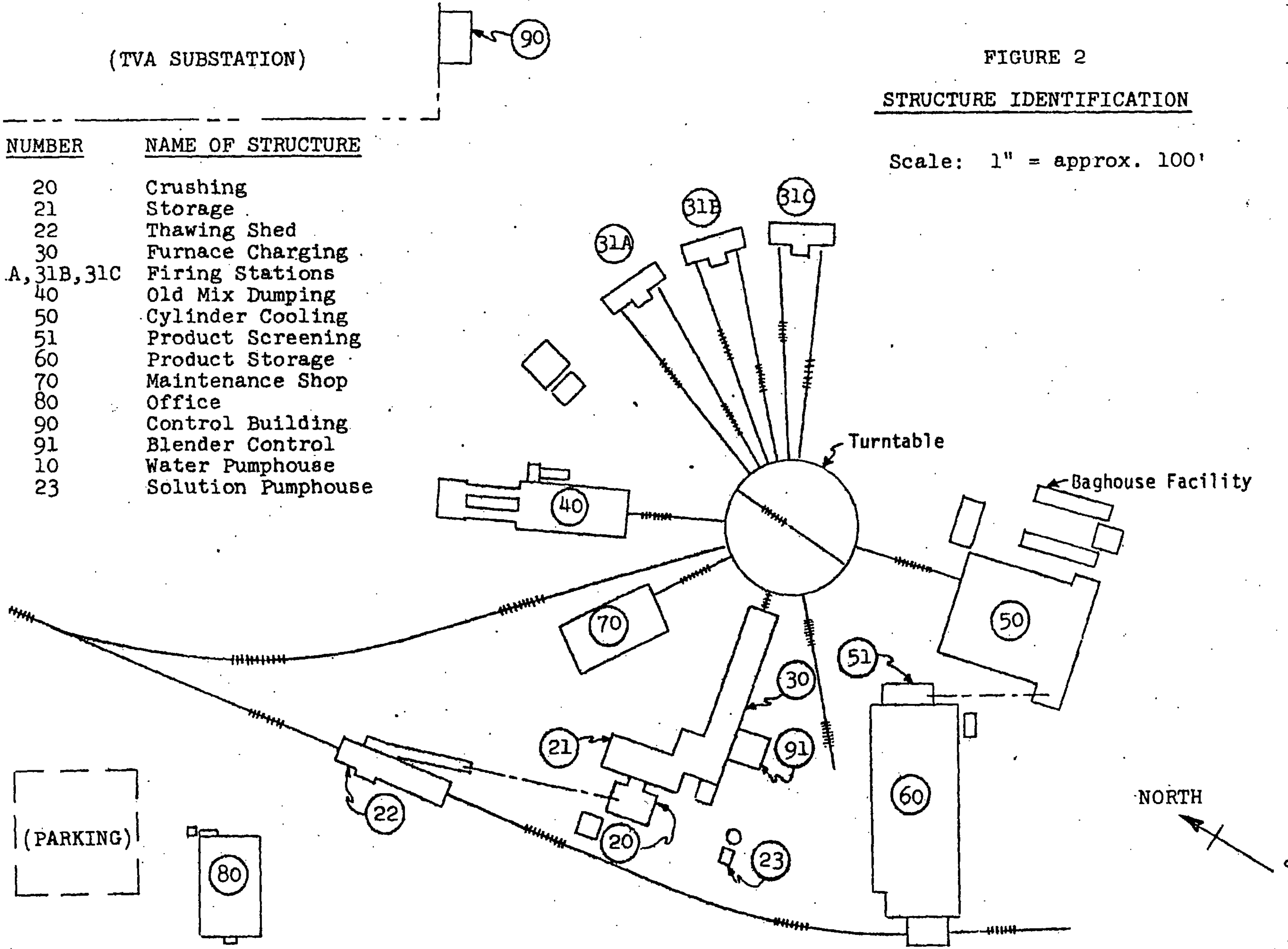
Process Flow Diagram

FIGURE 2

STRUCTURE IDENTIFICATION

Scale: 1" = approx. 100'

NUMBER	NAME OF STRUCTURE
20	Crushing
21	Storage
22	Thawing Shed
30	Furnace Charging
A,31B,31C	Firing Stations
40	Old Mix Dumping
50	Cylinder Cooling
51	Product Screening
60	Product Storage
70	Maintenance Shop
80	Office
90	Control Building
91	Blender Control
10	Water Pumphouse
23	Solution Pumphouse



Raw material proportioning and loading into the car furnaces occurs in buildings 21 and 30. During the loading process, a core of graphite is placed lengthwise within the charge to provide electrical conductivity and to establish a suitable resistance between terminals situated at either end of the furnace. The loaded car furnace is then transferred through a railway turntable to one of six firing stations, buildings 31A, 31B or 31C, were the electrical hookup is accomplished. A suitable reaction temperature is then established and maintained until the reaction is complete.

After a suitable cooling period, the car furnace is moved to building 40 where the unreacted material is removed. During the reaction process, this material serves to insulate sides of the car furnace from intense heat developed at the core. This unreacted material, now known as "old mix," is transferred to the old mix storage pile for subsequent re-use.

The car furnace with the reacted material is then allowed to cool further, afterwhich it is routed to building 50 for final unloading. At this point, the reacted material is in the form of a large hollow cylinder. Chunks of the cylinder are dislodged by a clamshell crane and removed to the floor of the building. This material is subsequently fed to a crusher, located in building 50, and then transferred by conveyor to buildings 51 and 60 for final processing. The finished product is shipped from the plant by truck and rail.

SUMMARY OF ENVIRONMENTAL TESTING PROGRAM AT

JACKSBORO, TENNESSEE ELECTRO MINERALS PLANT SITE

OCTOBER 22, 1980 AND JANUARY 27, 1981

PREPARED BY: Ronald J. Reid, III

APPROVED BY: Robert L. Wilcox

MARCH 13, 1931

SUMMARY OF ENVIRONMENTAL TESTING PROGRAM AT

JACKSBORO, TENNESSEE ELECTRO MINERALS PLANT SITE

OCTOBER 22, 1980 AND JANUARY 27, 1981

Two sampling and analysis programs were undertaken by Carborundum's Environmental Services Department to determine the environmental status of materials and wastes located at the Jacksboro, Tennessee Electro Minerals Division former plant site.

The materials in question were storage piles of raw materials (coke, sand), silicon carbide, and "old mix". The wastes consisted of a covered dump (dust collector fines), and two ponds which had been constructed to prevent runoff from the property.

The initial program was designed to determine whether or not these materials and wastes were regulated by the Environmental Protection Agency's Hazardous Waste Management System (RCRA), as promulgated February 26, 1980 (Federal Register, Volume 45, Number 39) and May 19, 1980 (Federal Register, Volume 45, Number 98). A total of thirty-eight (38) samples were collected on October 22, 1980, and analyzed in accordance with the requirements of these regulations. None of the samples tested were "hazardous" by the E.P.A. definition. As a result of this program, some of the materials stored at the site have been removed, and negotiations are currently underway to remove the remaining materials.

The second sampling and analysis program commenced on January 27, 1981, and was designed to determine which, if any, toxic or hazardous substances are present in the dump, pond water or pond. Additionally, tests were performed to determine the potential for these substances to leach from the materials and subsequently contaminate groundwater.

A total of five (5) composited samples were collected; four (4) from areas suspected to contain pollutants and one (1) to serve as a background sample. These samples were analyzed for 127 of the 129 E.P.A. Priority Pollutants.* This list of substances was developed by court order as the result of a suit brought against the E.P.A. by the Natural Resources Defense Council (NRDC) et. al. The priority pollutants represent those substances thought to be most worthy of immediate attention with respect to their potential to cause environmental damage.

The initial analyses showed that samples from two (2) areas (dump, "dry pond") contained priority pollutants. All organics in these two samples were at levels below 100 parts

*No analyses were performed for asbestos or TCDD (dioxin). Neither is pertinent to wastes disposed at the site and both require very special analysis.

per million (ppm). With the exception of zinc and copper (which did not exceed 200 ppm), all metals were also under 100 ppm.*

The two samples in which priority pollutants were detected were then subjected to the E.P.A. Leachate test procedure, designed to simulate the effect of natural leaching on the waste. The resulting leachate samples were then re-analyzed for the presence of priority pollutants. With the exception of methylene chloride and phenol, no contamination of the leachate was detected. Both of these were noted in trace amounts below the limits to accurately quantitate using accepted analytical methodology. In the case of methylene chloride, it is suspected that this was inadvertently and unavoidably introduced into the sample in the laboratory since it is a widely used volatile organic solvent. In the case of phenol, the trace amount noted (25 ppb) is more than two orders of magnitude below the presently published level to protect human health (3,500 ppb - Federal Register, Volume 45, Number 231/November 28, 1980).

The analytical results of this project show that the waste material does contain some pollutants of concern. Leachate testing demonstrates, however, that these substances are unlikely to contaminate area groundwater.

*NOTE: Due to the nature of the materials in the dump and dry pond, it would be expected that priority pollutants would be detected. The sampling and/or tests would have been subject to suspicion if they had not been detected.

MCI/CONSULTING ENGINEERS, INC.
P. O. Box 23154
McBride Lane
Knoxville, Tennessee 37922
Telephone (615) 966-9788

August 24, 1981

Division of Solid Waste Management
Department of Public Health
East Tennessee Regional Office
1522 Cherokee Trail
Knoxville, TN 37920

Attention: Mr. Mark Burris

RE: Close-out Procedures
The Carborundum Company
Jacksboro, Tennessee
MCI-81-455

Dear Mr. Burris:

Enclosed are two copies of the plans necessary for close-out of the subject facility. The subject plans and monitoring wells have been completed in accordance with specific guidelines recommended by the Tennessee Division of Solid Waste Management. Construction activities for close-out should commence by August 31, 1981. Upon review of the enclosed material, the Carborundum Company requests documented approval before major construction for close-out begins.

The Carborundum Company also requests that you or another DSWM representative observe at least a portion of the close-out construction activities. In addition, the company requests that you examine the site after completion of the construction activities to document implementation of your recommendations as referenced in your letter of June 24, 1981.

If you have any questions regarding the subject project, please feel free to call me.

Sincerely,

MCI/Consulting Engineers, Inc.

R. Randolph Ferguson

R. Randolph Ferguson
Environmental Engineer

RRF/aab

Enclosures

TABLE OF CONTENTS

APPENDICES

MCI/CONSULTING ENGINEERS, INC.
P. O. Box 23154
McBride Lane
Knoxville, Tennessee 37922
Telephone (615) 966-9788

August 24, 1981

Division of Solid Waste Management
Department of Public Health
East Tennessee Regional Office
1522 Cherokee Trail
Knoxville, TN 37920

Attention: Mr. Mark Burris

RE: Close-out Procedures
The Carborundum Company
Jacksboro, Tennessee
MCI-81-455

Gentlemen:

Presented herewith are the results of our geohydrologic investigations and construction plans necessary for close-out of the subject facility.

EXECUTIVE SUMMARY

The purpose of this report is to present the results of our geohydrologic investigations and our recommendations and design considerations for completion of close-out operations at the subject facility. In accordance with recommendations prescribed by the Tennessee Department of Public Health, Division of Solid Waste Management, construction plans have been developed to specify construction procedures necessary for containment of on-site waste materials and for minimization of infiltration into the local groundwater system.

BACKGROUND INFORMATION

The Jacksboro, Tennessee Electro Minerals Plant started production in 1971. Due primarily to rapidly increasing power costs, the Carborundum facility closed in October, 1979. During operation, the plant produced approximately 25,000 tons per year of "ferro-carbo", a granular silicon carbide material used as a metallurgical additive in the production of cast-iron and steel. Raw materials used in the production of "ferro-carbo" were petroleum coke and silica sand. Waste materials disposed on-site consisted primarily of dust particulates from the baghouse collectors.

In order to secure the Jacksboro Plant site environmentally, The Carborundum Company requested that the Tennessee Division of Solid Waste Management (DSWM) review the facility and submit its recommendations regarding close-out of the property. Accordingly, the DSWM submitted its recommendations and suggestions to Carborundum following an on-site field investigation. A copy of the letter containing these recommendations is provided in Appendix I. Basically, the DSWM suggested that Carborundum install groundwater monitoring wells at the site, line or fill two ponds to impede potential infiltration of site runoff into the local groundwater system, bury and cover a scrap waste material stockpile, and grade the on-site disposal area to promote surface drainage.

SITE CONDITIONS

The subject facility is located on Island Ford Road in the Campbell County Industrial Park approximately 1.5 miles southwest of Jacksboro, Tennessee, at latitude N 36° 18' 32" and longitude W 84° 11' 05" (U.S.G.S. Jacksboro, 136-SW Quadrangle). The site consists of approximately 105 acres of gently rolling land. The site facilities and additional areas to be described and referred to throughout this report are located on Sheet 1 of Appendix VI and include the following:

1. Settling pond
2. Clear pond (lagoon)
3. "Boneyard" (scrap pile)
4. Baghouse dust disposal area
5. Borrow area
6. "Old Mix" stockpile
7. Loading area
8. Natural pond
9. Sinkhole

Geology: The subject site is underlain by the Mascot Formation of the Knox Group. The bedrock consists of essentially flat-lying siliceous (cherty) dolomites and limestones. Weathering of the rock occurs along nearly horizontal bedding planes and enlarged vertical fractures (joints), producing moderately to highly plastic clays containing varying amounts of chert. Soil depths in this area are generally less than twenty feet, although greater depths may be encountered.

Surface Hydrology: The average annual precipitation for the subject area is approximately fifty inches. The rainfall is evenly distributed throughout the winter, spring, and summer months and is lowest in the fall. Surface runoff is diverted around the subject site by natural features and a railroad embankment. Surface runoff over the site consists of that amount of rain that falls directly onto the site. Sinkholes and springs are abundant in the immediate vicinity of the facility.

Groundwater Hydrology: The lack of a developed surface drainage system is typical of areas underlain with carbonate rocks which have undergone extensive solution activity. The drainage network is developed mainly in the subsurface and consists of interconnected solution openings developed along the horizontal bedding planes and the enlarged vertical joints. Based on observed topographic conditions and the underlying geologic strata, it is believed that the groundwater regime at the subject facility resembles a pipe network in which many small "feeder" pipes flow or seep into larger pipes carrying the majority of the flow, in conditions often approximating surface water flow.

PRELIMINARY INVESTIGATIONS

Initial field work consisted of on-site investigations to confirm the preliminary geologic and hydrologic assessments. Potential auger hole and piezometer locations were staked; mean sea level (MSL) elevations were established for each location.

Exploration and Testing: Augering and soil sampling were performed by Geologic Associates, Inc., utilizing a CME-450 drill rig. All drilling and sampling activities were supervised by a staff geologist. Split spoon and Shelby tube samples were obtained in accordance with ASTM D-1586 and

Office is Across St from Campbell Co. Courthouse Municipal Services Complex

PUBLIC WATER SYSTEM DATA

Name of Water System	CARYVILLE-JACKSBORO UTILITIES COMMISSION	PWSID NUMBER 322
Mailing Address: P.O. BOX 121		
City: JACKSBORO	County: CAMPBELL	
Zip Code: 37757	Office Phone: (423) 562-9776	Plant Phone: (423) 562-2234
	Fax- 423-566-4960	

Title of Person	Name	Certification	Interviewed	correspond.
GENERAL MANAGER	FRANK WALLACE	NONE		XX
DISTRIBUTION FOREMAN	J. B. MONDAY	WT4, DS2	XX	CC
MAINT./CROSS CONN.	C. R. AIKEN	WT4, DS2	XX	
CHIEF OPERATOR	JERRY WRIGHT (865-740-6550/CELL)	WT4, DS2	XX	CC
OPERATORS	WAYNE CLOTFELTER (WT4, DS2), CHARLES WILSON (WT4; DS2), DEXTER MARLOW (TAKING WT4 2005) MATT PETREE (TAKING WT4 2005)		XX	

No		source NAME	intake location: USGS Map - 136 SW LATITUDE LONGITUDE River mile: Decimal Degrees:	mark one: surface	ground	purchase	treatment: aeration	prechlorination	coagulation	sedimentation	filtration	corr control	softening	taste+odor	iron removal	fluoridation	disinfection
1	R	NORRIS LAKE INTAKE (FEEDS TO COVE LAKE PLANT / EP A / MICROFLOC FILTRATION)	LAT = 36.26139	X				X	X	X	X	X				X	X
	A	(COVE CREEK ON NORRIS LAKE)	LONG = 84.14416														
2	R	CAVE SPRING PLANT (EP B / DIRECT FILTRATION /	LAT = 36.30694		X				X		X	X				X	X
	A	[redacted]	LONG = 84.18611														
3	R	COVE LAKE (EMERGENCY TO EP A)	LAT = 36.29944	X				X	X	X	X	X		X	X	X	X
	A	(COVE CREEK / MILE 16.8)	LONG = 84.21389														
4	R	RIDGE ROAD WELLS (EMERGENCY TO EP A/B)	LAT = 35.63944		X			X	X	X	X	X				X	X
	A	(WELLS ARE UNDER SWI)	LONG = 83.43917														

Name of Systems served by this System	Other Systems Connected to this System
LAFOLLETTE UD (EMERGENCY)	NORTH ANDERSON CO. UD (CJUC BUYS 250,000 GAL. MIN. PER MO.)
	LAFOLLETTE UD (EMERGENCY)

Plant Classification: WT4

Distribution Classification: DS1 | Date Laboratory Certified: 01-19-05

Design Capacity: (S) 700 GPM / (G) 1228 GPM** | Filter Area: (S)176 FT^2 / (G) 307 FT^2 | Filter Rate: (S) & (G) @ 4.0 GPM/FT^2

Raw Water Pump Capacity: (S) 2 @ 1500 GPM / (G) 2 @ 600 GPM | Finished Water Pump Capacity: (S) 2 @ 500 GPM* / (G) 1 @ 600 GPM AND 1 @ 650 GPM

Clearwell Capacity: (S) .060 MG / (G) .065 MG | Date Cross-Connection Program Approved: 03-19-87 (UPDATED 2003)

Distribution Storage: 2.165 MG | Date of Last VOC Chemical Analysis: 07-26-02

Date of Last Inorganic Chemical Analysis: 05-07-02 / NO^3 IN 2004

Date of Last SOC Chemical Analysis: 10-30-02 | Date of Last Radionuclide Analysis: 11-01-02 (NOT GRANDFATHERED)

Date Emergency Plan Approved: 12-12-89 (UPDATED 2004) | Date of Last Survey: 01-15-03 | Last Rating: 100

Number of Wholesale Customers: 0 | Number of Meters: 3,792

Remarks: **BACTERIOLOGICAL @ 10 SAMPLES PER MONTH /** **SYSTEM ACTUALLY RATED AT 600 GPM DUE TO RAW WATER PUMPS BEING 600 GPM. THERE ARE 8 FILTERS AT PLANT, WHICH ALLOW FILTER RUNS TO BE LONGER AND HIGHER TURBIDITY TO BE ADEQUATELY FILTERED. [redacted], SO HAS NOT LOOKED IN PAST TO UPGRADE PUMPS. HOWEVER, WILL NEED TO DO SO IF DEMAND INCREASES AND BEFORE PLANT CAN BE RATED BASED ON ACTUAL FILTER AREA AND RATE. / *SYSTEM IN PROCESS OF INSTALLING 2 FINISHED WATER PUMPS CAPABLE OF 1200 GPM EACH- SCHEDULED TO BE COMPLETED 2005.

Date of Survey	Number of Connections	Household Factor	Population Served	Average Daily Pumpage (million gallons)	Maximum Day Pumpage (million gallons)	Surveyed By	Rating	Year
01-19-05	3792	2.44	9252	S 0.378 / G 0.653	S 0.743 / G 0.792	GEM	100	2005
01-15-03	3619	2.44	8803	S 0.638 / G 0.354	S 1.004 / G 0.505	FGS	100	2003
01-11-01	3398	2.65	9005	S 0.469 / G 0.524	S 0.984 / G 0.883	FGS	95	2001
01-13-98	3337	2.65	8843	S 0.324 / G 0.536	S 0.790 / G 0.783	FGS	90	1998

Water Use in the United States

50 years of water use information 1950–2000

Reports

- Estimated Use of Water in the United States in 2000
  Download 2000 data for counties
  Guidelines for Preparation of State Water-Use Estimates for 2000
- Estimated Use of Water in the United States in 1995
  Download 1995 data for counties and watersheds
- Estimated Use of Water in the United States in 1990
  Download 1990 or 1985 data for counties and watersheds
- More on reports

Comparison of consumptive use and renewable water supply by water-resources region

Introduction: The National Water-Use Information Program
Selected bibliography of USGS water-use reports by State
Handbook for collecting water-use data

If you have questions about water use in a specific State, please send e-mail to the USGS Water Use contact for that State. If you have questions about water use in the United States, send an e-mail to wu-info@usgs.gov.

More water-use information from USGS:
Water Science for Schools, especially the Water Questions & Answers

http://water.usgs.gov/watuse/spread95/tnh895.txt

1995	Year of data
TN	State Abbreviation (2-letter Postal ID)
47	State Code (2-digit numeric FIPS code)
06010205	HUC-8 code (8 digits)
Upper Clinch	HUC-8 name
44.58	Total population of the area, in thousands
	Public Supply
5.83	Population served by ground water, in thousands 3 PS-GWPop Hard coded
21.60	Population served by surface water, in thousands 4 PS-SWPop Hard coded
27.43	Total Population served, in thousands 5 PS-TOPop 3+4
0.84	Ground-water withdrawals, fresh 6 PS-WGWFr Hard coded
0.00	Ground-water withdrawals, saline 7 PS-WGWSa Hard coded
0.84	Total withdrawals, ground water 8 PS-WGWTo 6+7
2.33	Surface-water withdrawals, fresh 9 PS-WSWFr Hard coded
0.00	Surface-water withdrawals, saline 10 PS-WSWSa Hard coded
2.33	Total withdrawals, surface water 11 PS-WSWTo 9+10
3.17	Total withdrawals, fresh 12 PS-WFrTo 6+9
0.00	Total withdrawals, saline 13 PS-WSaTo 7+10
3.17	Total withdrawals, total 14 PS-WTotl 12+13
1.45	Deliveries to domestic 15 PS-DelDO 52
0.86	Deliveries to commercial 16 PS-DelCO 34
0.54	Deliveries to industrial 17 PS-DelIN 67
0.00	Deliveries to thermoelectric 18 PS-DelPT 102+120+138
2.85	Water deliveries, total deliveries 19 PS-DelTO 18+34+52+67
0.32	Water deliveries, public use and losses 20 PS-UsLos 14-18-34-52-67
115.57	Per-capita withdrawal, in gallons per day 21 PS-PrCap (14*1000.00)/5
0.00	Reclaimed wastewater 22 PS-RecWW Hard coded
3.00	Number of facilities 23 PS-Facil Hard coded
3.00	Number of facilities in site-specific Database 24 PS-FacDB Hard coded
	Commercial Water Use
0.06	Ground-water withdrawals, fresh 25 CO-WGWFr Hard coded
0.00	Ground-water withdrawals, saline 26 CO-WGWSa Hard coded
0.06	Total withdrawals, ground water 27 CO-WGWTo 25+26
0.00	Surface-water withdrawals, fresh 28 CO-WSWFr Hard coded
0.00	Surface-water withdrawals, saline 29 CO-WSWSa Hard coded
0.00	Total withdrawals, surface water 30 CO-WSWTo 28+29
0.06	Total withdrawals, fresh 31 CO-WFrTo 25+28
0.00	Total withdrawals, saline 32 CO-WSaTo 26+29
0.06	Total withdrawals 33 CO-WTotl 31+32
0.86	Deliveries from public suppliers 34 CO-PSDel Hard coded
0.92	Total withdrawals + deliveries 35 CO-WDelv 33+34
0.08	Consumptive use, fresh 36 CO-CUsFr Hard coded
0.00	Consumptive use, saline 37 CO-CUsSa Hard coded
0.08	Consumptive use, total 38 CO-CUTot 36+37
0.00	Reclaimed wastewater 39 CO-RecWW Hard coded

Domestic Water Use				
17.15	Self-supplied population, in thousands	40	DO-SSPop	2-5
1.11	Ground-water withdrawals, fresh	41	DO-WGWFr	Hard coded
0.00	Ground-water withdrawals, saline	42	DO-WGWSa	Hard coded
1.11	Total withdrawals, ground water	43	DO-WGWTo	41+42
0.00	Surface-water withdrawals, fresh	44	DO-WSWFr	Hard coded
0.00	Surface-water withdrawals, saline	45	DO-WSWSa	Hard coded
0.00	Total withdrawals, surface water	46	DO-WSWTo	44+45
1.11	Total withdrawals, fresh	47	DO-WFrTo	41+44
0.00	Total withdrawals, saline	48	DO-WSaTo	42+45
1.11	Total withdrawals	49	DO-WTotl	47+48
64.72	Per-capita use, self-supplied, in gallons per day	50	DO-SSPCp	(49*1000.00)/40
27.43	Public-supplied population	51	DO-PSPop	5
1.45	Deliveries from public suppliers	52	DO-PSDel	Hard coded
52.86	Per-capita use, public-supplied, in gallons per day	53	DO-PSPCp	(52*1000.00)/5
2.56	Total withdrawals plus deliveries	54	DO-WDelv	49+52
0.26	Consumptive use, fresh	55	DO-CUsFr	Hard coded
0.00	Consumptive use, saline	56	DO-CUsSa	Hard coded
0.26	Consumptive use, total	57	DO-CUTot	55+56
Industrial Water Use				
0.00	Ground-water withdrawals, fresh	58	IN-WGWFr	Hard coded
0.00	Ground-water withdrawals, saline	59	IN-WGWSa	Hard coded
0.00	Total withdrawals, ground water	60	IN-WGWTo	58+59
0.00	Surface-water withdrawals, fresh	61	IN-WSWFr	Hard coded
0.00	Surface-water withdrawals, saline	62	IN-WSWSa	Hard coded
0.00	Total withdrawals, surface water	63	IN-WSWTo	61+62
0.00	Total withdrawals, fresh	64	IN-WFrTo	58+61
0.00	Total withdrawals, saline	65	IN-WSaTo	59+62
0.00	Total withdrawals	66	IN-WTotl	64+65
0.54	Deliveries from public suppliers	67	IN-PSDel	Hard coded
0.54	Total withdrawals plus deliveries	68	IN-WDelv	66+67
0.06	Consumptive use, fresh	69	IN-CUsFr	Hard coded
0.00	Consumptive use, saline	70	IN-CUsSa	Hard coded
0.06	Consumptive use, total	71	IN-CUTot	69+70
0.00	Reclaimed wastewater	72	IN-RecWW	Hard coded
0.00	Number of facilities	73	IN-Facil	Hard coded
0.00	Number of facilities in site-specific Database	74	IN-FacDB	Hard coded
Thermoelectric Power Water Use (All fuel types)				
0.00	Ground-water withdrawals, fresh	75	PT-WGWFr	93+111+129
0.00	Ground-water withdrawals, saline	76	PT-WGWSa	94+112+130
0.00	Total withdrawals, ground water	77	PT-WGWTo	75+76
0.00	Surface-water withdrawals, fresh	78	PT-WSWFr	96+114+132
0.00	Surface-water withdrawals, saline	79	PT-WSWSa	97+115+133
0.00	Total withdrawals, surface water	80	PT-WSWTo	78+79
0.00	Total withdrawals, fresh	81	PT-WFrTo	75+78
0.00	Total withdrawals, saline	82	PT-WSaTo	76+79
0.00	Total withdrawals	83	PT-WTotl	81+82
0.00	Deliveries from public suppliers	84	PT-PSDel	102+120+138
0.00	Total withdrawals plus deliveries	85	PT-WDelv	83+84
0.00	Consumptive use, fresh	86	PT-CUsFr	104+122+140
0.00	Consumptive use, saline	87	PT-CUsSa	105+123+141
0.00	Consumptive use, total	88	PT-CUTot	86+87
0.00	Power generation, gigawatt hours	89	PT-Power	107+125+143
0.00	Reclaimed wastewater	90	PT-RecWW	108+126+144
0.00	Number of facilities	91	PT-Facil	109+127+145
0.00	Number of facilities in site-specific Database	92	PT-FacDB	110+128+146

Mining Water Use				
0.23	Ground-water withdrawals, fresh	147	MI-WGWFr	Hard coded
0.00	Ground-water withdrawals, saline	148	MI-WGWSa	Hard coded
0.23	Total withdrawals, ground water	149	MI-WGWTo	147+148
0.02	Surface-water withdrawals, fresh	150	MI-WSWFr	Hard coded
0.00	Surface-water withdrawals, saline	151	MI-WSWSa	Hard coded
0.02	Total withdrawals, surface water	152	MI-WSWTo	150+151
0.25	Total withdrawals, fresh	153	MI-WFrTo	147+150
0.00	Total withdrawals, saline	154	MI-WSaTo	148+151
0.25	Total withdrawals	155	MI-WTotl	153+154
0.02	Consumptive use, fresh	156	MI-CUsFr	Hard coded
0.00	Consumptive use, saline	157	MI-CUsSa	Hard coded
0.02	Consumptive use, total	158	MI-CUTot	156+157
0.00	Reclaimed wastewater	159	MI-RecWW	Hard coded
Livestock Water Use (Total)				
0.09	Ground-water withdrawals, fresh	160	LV-WGWFr	172+184
0.00	Ground-water withdrawals, saline	161	LV-WGWSa	173+185
0.09	Total withdrawals, ground water	162	LV-WGWTo	160+161
0.09	Surface-water withdrawals, fresh	163	LV-WSWFr	175+187
0.00	Surface-water withdrawals, saline	164	LV-WSWSa	176+188
0.09	Total withdrawals, surface water	165	LV-WSWTo	163+164
0.18	Total withdrawals, fresh	166	LV-WFrTo	160+163
0.00	Total withdrawals, saline	167	LV-WSaTo	161+164
0.18	Total withdrawals	168	LV-WTotl	166+167
0.18	Consumptive use, fresh	169	LV-CUsFr	181+193
0.00	Consumptive use, saline	170	LV-CUsSa	182+194
0.18	Consumptive use, total	171	LV-CUTot	169+170
Livestock Water Use (Stock)				
0.09	Ground-water withdrawals, fresh	172	LS-WGWFr	Hard coded
0.00	Ground-water withdrawals, saline	173	LS-WGWSa	Hard coded
0.09	Total withdrawals, ground water	174	LS-WGWTo	172+173
0.09	Surface-water withdrawals, fresh	175	LS-WSWFr	Hard coded
0.00	Surface-water withdrawals, saline	176	LS-WSWSa	Hard coded
0.09	Total withdrawals, surface water	177	LS-WSWTo	175+176
0.18	Total withdrawals, fresh	178	LS-WFrTo	172+175
0.00	Total withdrawals, saline	179	LS-WSaTo	173+176
0.18	Total withdrawals	180	LS-WTotl	178+179
0.18	Consumptive use, fresh	181	LS-CUsFr	Hard coded
0.00	Consumptive use, saline	182	LS-CUsSa	Hard coded
0.18	Consumptive use, total	183	LS-CUTot	181+182
Livestock Water Use (Animal specialties)				
0.00	Ground-water withdrawals, fresh	184	LA-WGWFr	Hard coded
0.00	Ground-water withdrawals, saline	185	LA-WGWSa	Hard coded
0.00	Total withdrawals, ground water	186	LA-WGWTo	184+185
0.00	Surface-water withdrawals, fresh	187	LA-WSWFr	Hard coded
0.00	Surface-water withdrawals, saline	188	LA-WSWSa	Hard coded
0.00	Total withdrawals, surface water	189	LA-WSWTo	187+188
0.00	Total withdrawals, fresh	190	LA-WFrTo	184+187
0.00	Total withdrawals, saline	191	LA-WSaTo	185+188
0.00	Total withdrawals	192	LA-WTotl	190+191
0.00	Consumptive use, fresh	193	LA-CUsFr	Hard coded
0.00	Consumptive use, saline	194	LA-CUsSa	Hard coded
0.00	Consumptive use, total	195	LA-CUTot	193+194

Totals				
2.33	Total ground-water withdrawals, fresh	235	TO-WGWFr	6+25+41+58+75+147+160+196
0.00	Total ground-water withdrawals, saline	236	TO-WGWSa	7+26+42+59+76+148+161+197
2.33	Total withdrawals, ground water	237	TO-WGWTo	235+236
2.44	Total surface-water withdrawals, fresh	238	TO-WSWFr	9+28+44+61+78+150+163+199
0.00	Total surface-water withdrawals, saline	239	TO-WSWSa	10+29+45+62+79+151+164+200
2.44	Total withdrawals, surface water	240	TO-WSWTo	238+239
4.77	Total withdrawals, fresh	241	TO-WFrTo	235+238
0.00	Total withdrawals, saline	242	TO-WSaTo	236+239
4.77	Total withdrawals	243	TO-WTotl	241+242
0.60	Consumptive use, fresh	244	TO-CUsFr	36+55+69+86+156+169+205
0.00	Consumptive use, saline	245	TO-CUsSa	37+56+70+87+157+170+206
0.60	Consumptive use, total	246	TO-CUTot	244+245
0.00	Reclaimed wastewater	247	TO-RecWW	22+39+72+90+159+213
0.00	Conveyance losses	248	TO-CLoss	208

Accounting Unit 060102 -- Upper Tennessee: The Tennessee River Basin above Watts Bar Dam, excluding the French Broad and Holston River Basins. Georgia, North Carolina, Tennessee, Virginia.
Area = 8360 sq.mi.

Cataloging Units

06010201 -- Watts Bar Lake. Tennessee.
Area = 1340 sq.mi.

06010202 -- Upper Little Tennessee. Georgia, North Carolina.
Area = 839 sq.mi.

06010203 -- Tuckasegee. North Carolina.
Area = 731 sq.mi.

06010204 -- Lower Little Tennessee. North Carolina, Tennessee.
Area = 1050 sq.mi.

06010205 -- Upper Clinch. Tennessee, Virginia.
Area = 1970 sq.mi.

06010206 -- Powell. Tennessee, Virginia.
Area = 939 sq.mi.

06010207 -- Lower Clinch. Tennessee.
Area = 620 sq.mi.

06010208 -- Emory. Tennessee.
Area = 866 sq.mi.

http://water.usgs.gov/nawqa/sparrow/wrr97/geograp/huc_name.txt

[This is the HUC_NAME.TXT file]

Boundary Descriptions and Names of Regions, Subregions,
Accounting Units and Cataloging Units

ESTIMATION OF THE GROUNDWATER PATHWAY TARGET POPULATION

Caryville-Jacksboro's Cave Spring intake supplied 0.653 million gallons average daily pumpage in 2005. The Norris Lake intake provided 0.378. The population served was 9252. The Cave Spring intake served approximately 9252x0.653/(0.653+0.378)=5860 population.

The 1995 U. S. Geological Survey National Water-Use Data Files lists 17,150 self-supplied population by ground-water withdrawals for domestic water use (USGS. 1995. U.S. Geolgical Survey, National Water-Use data files. http://water.usgs.gov/watuse/spread95/tnh895.txt) in the 1970 square mile Upper Clinch hydrologic unit, HUC8Code 06010205 (USGS. 2005a. U.S. Geolgical Survey, Water Resources of the United States. http://water.usgs.gov/GIS/huc_ name.txt Last updated June 16.).

Proportioned by area, by distance category, the following target self-supplied populations by ground-water withdrawals for domestic water use have been estimated:

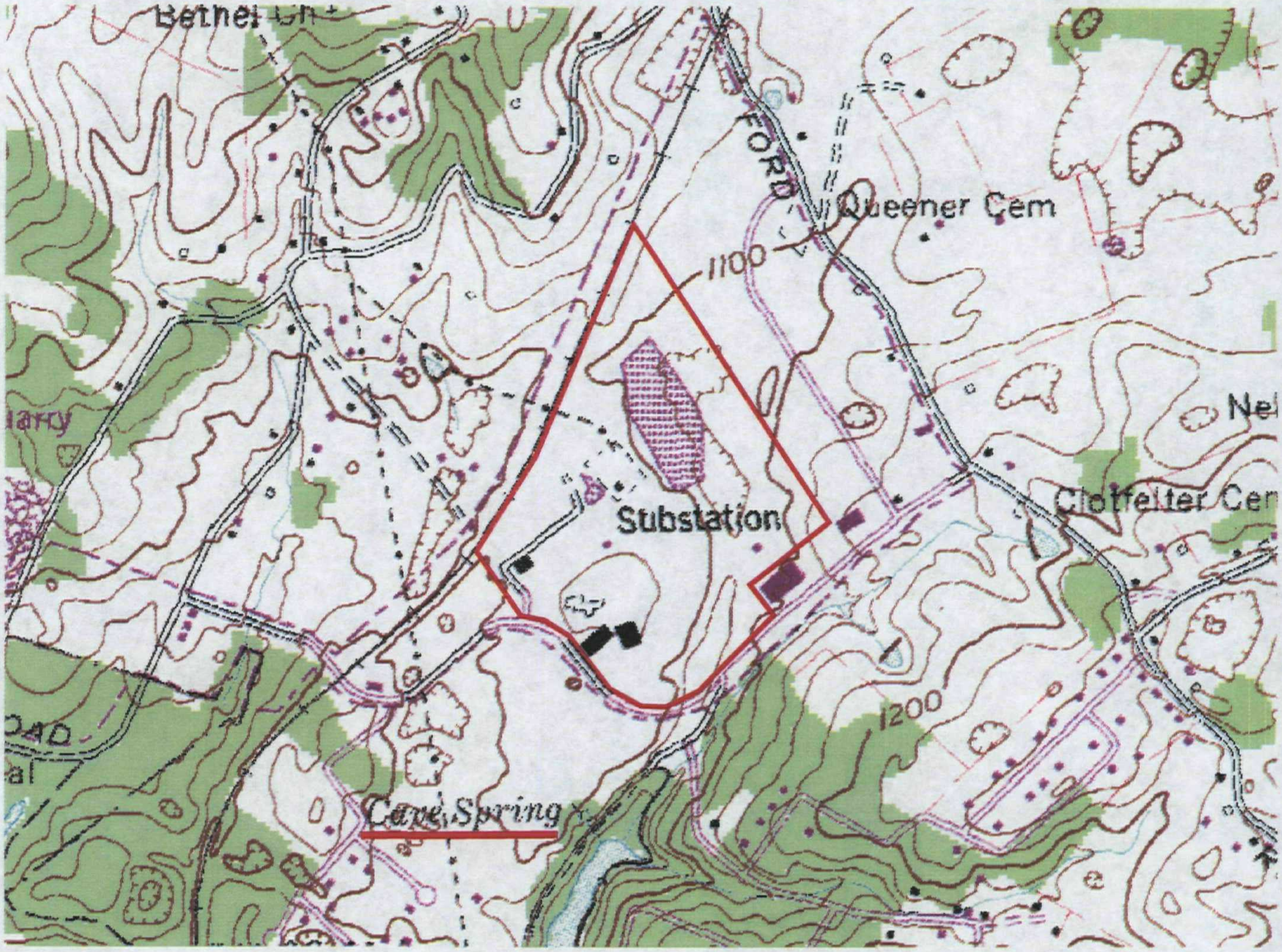
distance category	area (square miles)	target population
0 to ¼ mile	0.196	2
¼ to ½	0.589	5
½ to 1	2.36	21
1 to 2	9.42	82
2 to 3	15.7	137
3 to 4	22.0	192
0 to 4	50.3	439

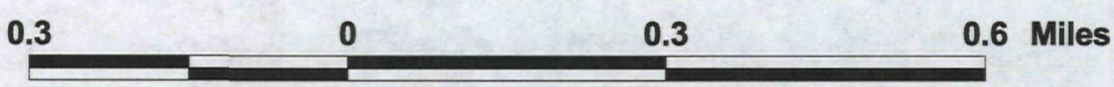
The total groundwater pathway target population is 439 + 5860 = 6299

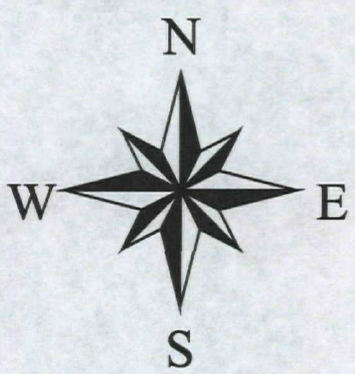
APPENDICES

1) Topographic Map
2) Latitude/longitude (at railcar reactor/firing station)
3) Pre-CERCLIS Screening Assessment Checklist / Decision Form
4) QuickScore Printout

CARBORUNDUM ELECTRO MINERALS
CARYVILLE, TN 37714
CAMPBELL CO.







84.183642

84° 11' 01.1"

36.309142

36° 18' 32.9"

Approximate location of Carborundum's railcar reactor/firing station 31A,

450 feet due north of the eastern corner of the Cylinder Cooling building

PRE-CERCLIS SCREENING ASSESSMENT CHECKLIST/DECISION FORM

This checklist can assist the site investigator during the Pre-CERCLIS screening. It will be used to determine whether further steps in the site investigation process are required under CERCLA. Use additional sheets, if necessary.

Checklist Preparer: Burl H. Maupin, Environmental Prot. Spec. (Name/Title) — 07/24/06 (Date)

3711 Middlebrook Pike, Knoxville, TN 37921 (Address)

burl.Maupin@state.tn.us (E-mail address)

Site Name: The Carborundum Co., Electro Minerals Div.

Previous Name (if any):

Site Location: Stone Mill Road (Street)

Caryville (City) TN (ST) 37714 (Zip)

Latitude: 36.309142 **Longitude:** 84.183642

Complete the following checklist. If "yes" is marked, please explain below.

	YES	NO
1. Does the site already appear in CERCLIS?		X
2. Is the release from products that are part of the structure of, and result in exposure within residential buildings or businesses or community structures?		X
3. Does the site consist of a release of a naturally occurring substance in its unaltered form, or altered solely through naturally occurring processes or phenomena, from a location where it is naturally found?		X
4. Is the release into a public or private drinking water supply due to deterioration of the system through ordinary use?		X
5. Is some other program actively involved with the site (i.e. another Federal, State, or Tribal program)?		X
6. Are the hazardous substances potentially released at the site regulated under a statutory exclusion (i.e., petroleum, natural gas, natural gas liquids, synthetic gas usable for fuel, normal application of fertilizer, release located in a workplace, naturally occurring, or regulated by the NRC, UMTRCA, or OSHA)?		X
7. Are the hazardous substances potentially released at the site excluded by policy considerations (e.g. deferral to RCRA Corrective Action)?		X
8. Is there sufficient documentation that clearly demonstrates that there is no potential for a release that could cause adverse environmental or human health impacts (e.g., comprehensive remedial investigation equivalent data showing no release above ARAR's, completed removal action, documentation showing that no hazardous substance releases have occurred, EPA approved risk assessment completed)?		X

Please explain all "yes" answer(s), attach additional sheets if necessary:

Site Determination:

☒ Enter the site into CERCLIS. Further assessment is recommended (explain below)

☐ The site is not recommended for placement into CERCLIS (explain below).

DECISION/DISCUSSION/RATIONALE:

Regional EPA Reviewer: Donna K Welsh — 1/22/07
Print Name/Signature — Date

State Agency/Tribe: Burl H. Maupin Burl H. Maupin — 7-24-06
Print Name/Signature — Date

(Carborundum)

****** CONFIDENTIAL ******
******PRE-DECISIONAL DOCUMENT ******
****** SUMMARY SCORESHEET ******
****** FOR COMPUTING PROJECTED HRS SCORE ******

****** Do Not Cite or Quote ******

Site Name: Carborundum, Electro Minerals Division	Region: 4
City, County, State: Caryville, Campbell Co. TN	Evaluator: Burl H. Maupin, TDEC
EPA ID#: TND057049322	Date: 9/20/2006
Lat/Long: N 36° 18' 32.9" / W 84° 11' 01.1"	T/R/S: Caryville, TN, Campbell Co.

Congressional District: 04

This Scoresheet is for: Pre-CERCLIS Screening

Scenario Name: PAH threat to GW, SW, & SE pathways

Description: Benzo(b)fluoranthene and benzo(k)fluoranthene have been detected in a spring near the Site. Benzo(b)fluoranthene, benzo(k)fluoranthene, and other polycyclic aromatic hydrocarbons have been detected in wastes on the surface and buried at the Carborundum Site.

The subject electric furnace facility is located on Stone Mill Road within the City Limits of Caryville at latitude N 36° 18' 32.9" and longitude W 84° 11' 01.1" (U.S.G.S. Jacksboro, 136-SW Quadrangle). The Site consists of approximately 105 acres of gently rolling land, now used for industrial, commercial, and public utility purposes, containing a church that was recently a school/daycare facility, surrounded by commercial, industrial, and residential development, and is approximately 0.2 mile from Cave Spring, the major source for the blended Caryville - Jacksboro U. D. that serves a population of 9000. A large portion of the surface water discharge from the Site occurs to groundwater via sinkholes. Groundwater to surface water discharge to Norris Reservoir (Cove Creek and Clinch River), and, possibly Cave Spring, may occur. Production at the Carborundum facility began in 1971 and ceased in 1979. Releases of hazardous substances to the environment occurred due to uncontrolled particulate matter releases to the atmosphere (and subsequent deposition onto soils and into waters), and Department approved on-site disposal of solid wastes in absence of permit requirements. Plant close-out procedures occurred in 1981.

Division of Air Pollution Control/KFO no longer has files on this facility. The Rules of the Division of Air Pollution Control, Chapter 1200-3-19, "Emission Standards and Monitoring Requirements for Additional Control Areas" lists the area bounded by the fence along the property line of the Carborundum Company as a Particulate Additional Control Area. While Carborundum was operating, Division of Air Pollution Control personnel received many complaints about emissions from the facility and, in 1979, observed "horrible" particulate emissions from smoking railroad cars containing a mixture that included sand, petroleum coke, and sawdust. Large electric currents were passed through the specially constructed railroad cars while they were located outdoors. Particulate and gaseous emissions migrated to several residences, and elsewhere. There was no containment of the emissions to the atmosphere from the railcar furnace firing stations until air pollution control equipment was installed shortly before operations ceased. There was inadequate containment of wastewater discharges to a small settling pond until a larger settling pond was constructed shortly before operations ceased.

The Division of Solid Waste Management/KFO files contain information that indicates that Carborundum's "gaseous and particulate emissions from the furnace and the associated handling operations are collected by air pollution control devices. These emissions then become a solid waste destined for disposal [in a trench] on Carborundum's own property. The various components of this solid waste stream include petroleum coke, silicon dioxide, silicon carbide, lime, and sulfur oxides" totaling approximately 3600 pounds per day, in 1979. Carborundum requested permission to dispose of "5000 tons of silicon carbide material...at the 'Weatherspoon' Company of Knoxville...Landfill/Disposal area" in 1981. The chemical breakdown was indicated to be as follows:

Silicon Carbide:	13.9%
Free Carbon:	40.68%
Silica (SiO_2):	27.37%
Loss On Ignition:	49.21%

A few days later the results of an EP Toxity test were submitted which showed leachable concentrations of As and Se, but none for Ba, Cd, Cr, Pb, Hg, and Ag. Carborundum requested approval for disposal at a "Weatherspoon" facility, but was advised that the Weatherspoon Company did not own a registered landfill/disposal facility. Subsequent correspondence indicates that, in 1981, there was an acceptable closure plan relative to the solid waste remaining on the Site, that two monitoring wells were placed on the Site, and that "all conditions for closing the facility were accomplished over and above the closure plans and our recommendations."

Literature Search:

The abrasives industry is composed of the following separate types of manufacturing: abrasive grain manufacturing, bonded abrasive product manufacturing, and coated abrasive product manufacturing. The Standard Industrial Classification (SIC) code for abrasives manufacturing is 3291. This SIC code encompasses abrasive grain production, coated and bonded abrasive products manufacturing, and several related industries. The six-digit Source Classification Codes (SCC's) for abrasive grain processing is 3-05-035.

The most commonly used abrasive materials are aluminum oxides and silicon carbide. These synthetic materials account for as much as 80 to 90 percent of the total quantity of abrasive grains produced domestically. Other materials used for abrasive grains are cubic boron nitride (CBN), synthetic diamonds, and several naturally occurring minerals such as garnet and emery.

Silicon carbide (SiC) is manufactured in a resistance arc furnace, which is a refractory enclosure, typically 3 meters (m) (10 feet [ft]) high, 3 m (10 ft) wide, and up to 12 m (40 ft) long with a carbon graphite electrode entering the furnace at both ends. The furnace is charged with a mixture of approximately 60 percent silica sand and 40 percent finely ground petroleum coke. A small amount of sawdust is added to the mix to increase its porosity so that the carbon monoxide gas formed during the process can escape freely. Common salt is added to the mix to serve two purposes. First, it acts as a catalyst to promote the carbon-silicon reaction. Second, it assists in the purification of the silicon carbide because it combines with impurities in the sand and coke to form chlorides, which can then be eliminated from the mix by volatilization. The furnace is half filled with this mixture then a core of granular carbon (graphite), which serves as an electrical conductor, is laid down between the two electrodes in the ends of the furnace. The furnace is then completely filled. Some furnaces may contain as much as 90,000 kilograms (kg) (200,000 pounds [lb]) of mix which could yield up to 11,000 kg (25,000 lb) of silicon carbide.

Approximately 300 volts is applied to the electrodes for up to 36 hours, over which time the voltage drops to 200 volts. During the heating period, the furnace core reaches approximately 2200 degrees C (4000 degrees F), at which point a large portion of the load crystallizes. After a prescribed period at the target temperature, the furnace is cooled [using water?] for about 24 hours, and then the side walls of the furnace are removed to expose the charge. At the end of the run, the furnace contains a core of loosely knit silicon carbide crystals surrounded by unreacted or partially reacted raw materials. The silicon carbide crystals are removed to begin processing into abrasive grains. The center core of graphite is usually saved to be reused, as is the partially reacted or unreacted mixture.

Abrasive grains for both bonded and coated abrasive products are made by graded crushing and close sizing of either natural or synthetic abrasives. Raw abrasive materials first are crushed by primary crushers and are then reduced by jaw crushers to manageable size, approximately 19 millimeters (mm) (0.75 inches [in]). Final crushing is usually accomplished with roll crushers, which break up the small pieces into a usable range of sizes. The crushed abrasive grains are then separated into specific grade sizes by passing them over a series of screens. If necessary, the grains are washed in classifiers to remove slimes, dried, and passed through magnetic separators to remove iron-bearing material, before the grains are again closely sized on screens. This careful sizing is necessary to prevent contamination of grades by coarser grains. Sizes finer than 0.10 millimeter (mm) (250 grit) are separated by hydraulic flotation and sedimentation or by air classification.

Little information is available on emissions from the manufacturing of abrasive grains and products. However, based on similar processes in other industries, some assumptions can be made about the types of emissions that are likely to result from abrasives manufacturing. Emissions from the production of synthetic abrasive grains, such as aluminum oxide and silicon carbide, are likely to consist primarily of particulate matter (PM), PM less than 10 micrometers (PM-10), and carbon monoxide (CO) from the furnaces. The PM and PM-10 emissions are likely to consist of filterable, inorganic condensible, and organic condensible PM. The addition of salt and sawdust to the furnace charge for silicon carbide production is likely to result in emissions of chlorides and volatile organic compounds (VOC).

A recent Toxic Release Inventory indicates that facilities engaged in only abrasive products manufacturing (SIC 3291, NAICS 32791) have reported the release or transfer of the following hazardous substances:

acetone	dichloromethane	nitrate compounds
aluminum oxide	ethoxyethanol, 2-	phenol
ammonia	formaldehyde	polycyclic aromatic compounds
barium	lead	selenium
cadmium	manganese	sodium nitrite
chromium	methanol	styrene
copper	methyl ethyl ketone	toluene
creosote	naphthalene	trichloroethane, 1,1,1-
dichlorobenzene, 1,4-	nickel	zinc

The following hazardous substances may also be present in abrasive products manufacturing emissions:

antimony	chlorides	mercury
arsenic	fluorides	sulfates
beryllium	iron	thallium

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	100	10000
Surface Water Migration Pathway Score (S_{sw})	37.49	1405.5001
Soil Exposure Pathway Score (S_s)	1.07	1.1449
Air Migration Score (S_a)	0	0
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		11406.645
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2851.66125
/ $(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		53.4

υ Pathways not assigned a score (explain): Quickscore will not allow entry of substances in air pathway. The pop-up warning advises entry of particulate mobility factor value, but attempts to enter the value of 0.00008 are rejected.

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated: Cave Spring			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550	
2. Potential to Release:			
2a. Containment	10		
2b. Net Precipitation	10		
2c. Depth to Aquifer	5		
2d. Travel Time	35		
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500		
3. Likelihood of Release (higher of lines 1 and 2e)	550		550
Waste Characteristics:			
4. Toxicity/Mobility	(a)	200	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		10
Targets:			
7. Nearest Well	(b)	45	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(b)	6000	
8d. Population (lines 8a + 8b + 8c)	(b)	9000	
9. Resources	5	5	
10. Wellhead Protection Area	20	20	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		9070
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100		100
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		100

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-1 --SURFACE WATER OVERLAND/FLOOD MIGRATION COMPONENT SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Watershed Evaluated:			
Drinking Water Threat			
Likelihood of Release:			
1. Observed Release	550	550	
2. Potential to Release by Overland Flow:			
2a. Containment	10		
2b. Runoff	10		
2c. Distance to Surface Water	5		
2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	35		
3.Potential to Release by Flood:			
3a. Containment (Flood)	10		
3b. Flood Frequency	50		
3c. Potential to Release by Flood (lines 3a x 3b)	500		
4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)	500		
5. Likelihood of Release (higher of lines 1 and 4)	550		550
Waste Characteristics:			
6. Toxicity/Persistence	(a)	100	
7. Hazardous Waste Quantity	(a)	100	
8. Waste Characteristics	100		10
Targets:			
9. Nearest Intake	50	0	
10. Population:			
10a. Level I Concentrations	(b)		
10b. Level II Concentrations	(b)		
10c. Potential Contamination	(b)	3000	
10d. Population (lines 10a + 10b + 10c)	(b)		
11. Resources	5		
12. Targets (lines 9 + 10d + 11)	(b)		0
Drinking Water Threat Score:			
13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]	100		0
Human Food Chain Threat			
Likelihood of Release:			
14. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:			
15. Toxicity/Persistence/Bioaccumulation	(a)	500000000	
16. Hazardous Waste Quantity	(a)	100	
17. Waste Characteristics	1000		320
Targets:			
18. Food Chain Individual	50	20	
19. Population			
19a. Level I Concentration	(b)		
19b. Level II Concentration	(b)		
19c. Potential Human Food Chain Contamination	(b)	0	
19d. Population (lines 19a + 19b + 19c)	(b)		
20. Targets (lines 18 + 19d)	(b)		2
Human Food Chain Threat Score:			
21. Human Food Chain Threat Score [(lines 14x17x20)/82500, subject to max of 100]	100		4.27
Environmental Threat			
Likelihood of Release:			
22. Likelihood of Release (same value as line 5)	550		550
Waste Characteristics:			
23. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	500000000	
24. Hazardous Waste Quantity	(a)	100	
25. Waste Characteristics	1000		320

Targets:			
26. Sensitive Environments			
26a. Level I Concentrations	(b)	0	
26b. Level II Concentrations	(b)	0	
26c. Potential Contamination	(b)	1	
26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)		
27. Targets (value from line 26d)	(b)		
Environmental Threat Score:			
28. Environmental Threat Score [(lines 22x25x27)/82,500 subject to a max of 60]	60		2.13
Surface Water Overland/Flood Migration Component Score for a Watershed			
29. Watershed Score[c] (lines 13+21+28, subject to a max of 100}	100		6.4
Surface Water Overland/Flood Migration Component Score			
30. Component Score (S_{sw})[c] (highest score from line 29 for all watersheds evaluated)	100		6.4

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 4-25 --GROUND WATER TO SURFACE WATER MIGRATION COMPONENT SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated:			
Drinking Water Threat			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	550	
2. Potential to Release:			
2a. Containment	10		
2b. Net Precipitation	10		
2c. Depth to Aquifer	5		
2d. Travel Time	35		
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500		
3. Likelihood of Release (higher of lines 1 and 2e)	550		550
Waste Characteristics:			
4. Toxicity/Mobility	(a)	100	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		10
Targets:			
7. Nearest Well	(b)	2	
8. Population:			
8a. Level I Concentrations	(b)		
8b. Level II Concentrations	(b)		
8c. Potential Contamination	(b)	3000	
8d. Population (lines 8a + 8b + 8c)	(b)	0	
9. Resources	5	0	
10. Targets (lines 7 + 8d + 9)	(b)	2	
Drinking Water Threat Score:			
11. Drinking Water Threat Score ([lines 3 x 6 x 10]/82,500, subject to max of 100)	100		0.133333333 333333
Human Food Chain Threat			
Likelihood of Release:			
12. Likelihood of Release (same value as line 3)	550		550
Waste Characteristics:			
13. Toxicity/Mobility/Persistence/Bioaccumulation	(a)	5000000	
14. Hazardous Waste Quantity	(a)	100	
15. Waste Characteristics	1000		100
Targets:			
16. Food Chain Individual	50		
17. Population			
17a. Level I Concentration	(b)		
17b. Level II Concentration	(b)		
17c. Potential Human Food Chain Contamination	(b)	20	
17d. Population (lines 17a + 17b + 17c)	(b)	20	
18. Targets (lines 16 + 17d)	(b)		40
Human Food Chain Threat Score:			
19. Human Food Chain Threat Score [(lines 12x15x18)/82,500,suject to max of 100]	100		26.66666666 66667
Environmental Threat			
Likelihood of Release:			
20. Likelihood of Release (same value as line 3)	550		550
Waste Characteristics:			
21. Ecosystem Toxicity/Persistence/Bioaccumulation	(a)	100000000	
22. Hazardous Waste Quantity	(a)	100	
23. Waste Characteristics	1000		320
Targets:			
24. Sensitive Environments			
24a. Level I Concentrations	(b)		

24b. Level II Concentrations	(b)		
24c. Potential Contamination	(b)	5	
24d. Sensitive Environments (lines 24a + 24b + 24c)	(b)	5	
25. Targets (value from line 24d)	(b)		5
Environmental Threat Score:			
26. Environmental Threat Score [(lines 20x23x25)/82,500 subject to a max of 60]	60		10.69
Ground Water to Surface Water Migration Component Score for a Watershed			
27. Watershed Score[c] (lines 11 + 19 + 28, subject to a max of 100)	100		37.49
28. Component Score (S_{gs})[c] (highest score from line 27 for all watersheds evaluated, subject to a max of 100)	100		37.49

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer

TABLE 5-1 --SOIL EXPOSURE PATHWAY SCORESHEET			
Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Exposure:			
1. Likelihood of Exposure	550		550
Waste Characteristics:			
2. Toxicity	(a)	10000	
3. Hazardous Waste Quantity	(a)	100	
4. Waste Characteristics	100		32
Targets:			
5. Resident Individual	50	0	
6. Resident Population:			
6a. Level I Concentrations	(b)		
6b. Level II Concentrations	(b)		
6c. Population (lines 6a + 6b)	(b)		
7. Workers	15	5	
8. Resources	5	0	
9. Terrestrial Sensitive Environments	(c)		
10. Targets (lines 5 + 6c + 7 + 8 + 9)	(b)		5
Resident Population Threat Score			
11. Resident Population Threat Score (lines 1 x 4 x 10)	(b)		88000
Nearby Population Threat			
Likelihood of Exposure:			
12. Attractiveness/Accessibility	100	10	
13. Area of Contamination	100	20	
14. Likelihood of Exposure	500		5
Waste Characteristics:			
15. Toxicity	(a)	10000	
16. Hazardous Waste Quantity	(a)	100	
17. Waste Characteristics	100		32
Targets:			
18. Nearby Individual	1	1	
19. Population Within 1 Mile	(b)	1310	
20. Targets (lines 18 + 19)	(b)		1
Nearby Population Threat Score			
21. Nearby Population Threat (lines 14 x 17 x 20)	(b)		160
Soil Exposure Pathway Score:			
22. Pathway Score[d] (S_s), [lines (11+21)/82,500, subject to max of 100]	100		1.07

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to a maximum of 60
[d] Do not round to nearest integer

Table 6-1 --Air Migration Pathway Scoresheet			
Factor categories and factors	Maximum Value	Value Assigned	
Likelihood of Release:			
1. Observed Release	550	550	
2. Potential to Release:			
2a. Gas Potential to Release	500		
2b. Particulate Potential to Release	500	10	
2c. Potential to Release (higher of lines 2a and 2b)	500	10	
3. Likelihood of Release (higher of lines 1 and 2c)	550		10
Waste Characteristics:			
4. Toxicity/Mobility	(a)	8E-5	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		0
Targets:			
7. Nearest Individual	50	20	
8. Population:			
8a. Level I Concentrations	(b)		
8b. Level II Concentrations	(b)		
8c. Potential Contamination	(c)		
8d. Population (lines 8a + 8b + 8c)	(b)		
9. Resources	5	0	
10. Sensitive Environments:			
10a. Actual Contamination	(c)		
10b. Potential Contamination	(c)		
10c. Sensitive Environments (lines 10a + 10b)	(c)		
11. Targets (lines 7 + 8d + 9 + 10c)	(b)		20
Air Migration Pathway Score:			
12. Pathway Score (S_a) [(lines 3 x 6 x 11)/82,500][d]	100		0

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] No specific maximum value applies to factor. However, pathway score based solely on sensitive environments is limited to a maximum of 60.
[d] Do not round to nearest integer